

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

PIPELINE (Ft) CODE 516

DEFINITION

Pipeline having an inside diameter of 4 inches or less.

PURPOSE

To convey water from a source of supply to points of use for livestock, wildlife, or recreation.

CONDITIONS WHERE PRACTICE APPLIES

Where it is desirable or necessary to convey water in a closed conduit from one point to another.

CRITERIA

Capacity. For livestock water, the installation shall have a capacity to provide seasonal high daily water requirements for the number and species of animals to be supplied. Animal water requirements can be obtained from the "Montana Stockwater Manual" or estimated at 15 gallons per 1000 pounds of herd weight.

For recreation areas, the water capacity shall be adequate for all planned uses. Typical examples are drinking water, fire protection, showers, flush toilets, and irrigation of landscaped areas.

Additional water capacity will be provided for wildlife when applicable.

Sanitary protection. If water from the pipeline is to be used for human consumption, applicable state and local regulations shall be met. When a pipeline serving livestock is supplied from a system that provides water for human consumption, backflow prevention valves shall be used.

Pipe. All pipe must withstand the pressure it will be subjected to, including hydraulic transients, internal pressures and external pressures. As a safety factor against surge or water hammer, the working pressure should not exceed 72% of the pressure rating of the pipe and the design flow velocity at system capacity should not exceed 5 ft/sec. If either of these limits is exceeded, special consideration must be given to flow conditions and measures must be taken to adequately protect the pipeline against surge.

Steel pipe shall meet the requirements of ASTM A-120. Galvanized steel pipe shall meet the requirements of ASTM A-53.

Plastic pipe shall conform to the requirements of the ASTM and AWWA specifications, as applicable, using the list in Table 1.

Plastic pressure pipe fittings shall conform to the ASTM specifications in Table 1, as applicable.

Solvents for solvent-welded plastic pipe joints shall conform to the ASTM specifications in Table 1, as applicable.

Rubber gaskets for pipe joints shall conform to the requirements of ASTM F-477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

Drainage. Valves or unions shall be installed at low points in the pipeline so that the line can be drained as needed. Check valves shall be installed as needed to protect groundwater quality or maintain a full pipeline.

Vents. Design shall provide for entry and removal of air along the pipeline, as needed, to prevent air locking or pipe collapse. If parts of the line are above the hydraulic gradient, periodic use of an air pump may be required. Provisions shall be made for pressure relief, air relief and vacuum relief as needed to protect the pipeline.

Joints. Watertight joints with a strength equal to that of the pipe shall be used. Couplings must be of material compatible with that of the pipe. If they are made of material susceptible to corrosion, provisions must be made to protect them. Insert-type fittings for PE pipe shall be double clamped with stainless steel clamps.

Gravity systems. Gravity systems are those that operate under low pressure without a pump. The pressure is normally less than 15 psi, and the length is normally less than 1500 feet. The minimum pipe size shall be 1 inch diameter for gravity flow. Gravity flow pipelines from spring developments may need to be larger (see Chapter 12 of the Engineering Field Handbook). Low pressure pumping systems such as

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Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the MN Natural Resources Conservation Service in your area, or download it from the electronic Field Office Technical Guide for Minnesota.

nose pumps, solar pumps, etc. will be considered gravity systems if the pressure does not exceed 15 psi.

Pressure Pump System. Pump pressure systems are those that have pressures in excess of 15 psi. Pressure systems shall be designed by an engineer, approved engineering procedure, or by a reputable pump pressure system dealer. The design shall account for local site conditions and topography. Pipe friction losses shall be computed by the Hazen-Williams equation. The minimum pipe size shall be 1-inch diameter for pressure systems.

Protection. When steel pipe is used, interior protective coatings shall be provided in accordance with NRCS Conservation Practice Standard 430FF, Irrigation Water Conveyance, Steel Pipeline. If a coal-tar enamel protective coating is needed for corrosion protection, the coating shall meet the requirements of AWWA Specification C-203.

Steel pipe installed above ground shall be galvanized or shall be protected with a suitable protective paint coating, including a primer coat and two or more final coats.

Plastic pipe installed above ground shall be resistant to ultraviolet light throughout the intended life of the pipe. PE pipe made with materials with 2 percent carbon black are acceptable. Pipe of this type is suitable for seasonal use.

Reasonable measures should be taken to protect the pipe from potential vandalism.

Thermal expansion shall be considered in the design of polyethylene (PE) pipe systems laid on the ground surface. PE pipe shall be “snaked” at intervals along its length. The pipe shall be allowed to deflect laterally.

All pipes shall be protected from hazards presented by traffic, farm operations, freezing temperatures, fire, thermal expansion and contraction. Pipelines laid on the surface shall be protected by placement outside of perimeter fences, under cross fences, or by shallow burying where the soils are suitable. Vegetation should be allowed to grow over the pipeline where possible to provide additional protection from sunlight and to keep the water cool. Where fire will be used as a management tool, specific provisions must be made to protect the pipe.

Pipelines to be kept in service over winter shall be buried a minimum of 6 feet in normal conditions. At locations where thick vegetation or snow depth can be assured for insulation, the minimum depth may be adjusted. For pipelines from spring developments that will flow constantly, the minimum burial depth for winter use is 18 inches.

On buried pipelines, water bars should be installed across the trench on long slopes or other locations where runoff water would be intercepted by the pipeline trench and cause erosion.

Seasonal use pipelines that will be subject to freezing shall be drained prior to winter or made of freeze resistant materials. Freeze resistant pipe will allow some expansion without breakage as water freezes. However, valves and fittings may still be damaged if they freeze with water in them.

Vegetation. Disturbed areas shall be established with vegetation or otherwise stabilized as soon as practical after construction. Seedbed preparation, seeding, fertilizing, and mulching shall conform to NRCS Conservation Practice Standard 342, Critical Area Planting.

CONSIDERATIONS

Visual resources. The visual design of pipelines and appurtenances in areas of high public visibility and in fragile ecosystems shall be carefully considered.

PLANS AND SPECIFICATIONS

Plans and specifications for installing pipelines shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. If the pipeline is a component of a system that includes additional conservation practices, the information necessary to construct these additional practices will also be conveyed on the plans.

The Engineering Field Handbook, Chapter 5, will guide the development of plans.

OPERATION AND MAINTENANCE

An O&M plan specific to the type of installed pipeline shall be provided to the landowner. The plan shall include, but not be limited to, the following provisions:

- Opening/closing valves to prevent excessive water hammer;
- Filling at the specified rate requirements;
- Inspecting and testing valves, pressure regulators, pumps, switches and other appurtenances;
- Maintaining erosion protection at outlets;
- Checking for debris, minerals, algae and other materials which may restrict system flow; and
- Draining and/or providing for cold weather operation of the system.

REFERENCES

Engineering Field Handbook
Montana Stockwater Manual

Table 1. Plastic Pipe Materials, Fittings, and Solvents for Pipeline Installation

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| Pipe Materials (ASTM Specifications unless otherwise noted) | D 1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80 |
| | D 1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 |
| | D 2104 Polyethylene (PE) Plastic Pipe, Schedule 40 |
| | D 2239 Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter |
| | D 2241 Poly(Vinyl Chloride) (PVC), Pressure-Rated Pipe (SDR) |
| | D 2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR) |
| | D 2447 Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter |
| | D 2737 Polyethylene (PE) Plastic Tubing |
| | D 2672 Joints for IPS PVC Using Solvent Cement |
| | D 3035 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter |
| | AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches |
| | AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, ½ inch through 3 inches |
| Pressure Fittings (ASTM Specifications) | D 2464 Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 |
| | D 2466 Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 |
| | D 2467 Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 |
| | D 2468 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40 |
| | D 2609 Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe |
| | D 2683 Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing |
| | D 3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals |
| | D 3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing |
| Solvents (ASTM Specifications) | D 2235 Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings |
| | D 2564 Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings |
| | D 2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings |